

light and air. In examining the surface-mud of a shallow rain-water pool, in a recent excavation in brick-clay, the author found little else but an abundance of minute diatoms. He was not sufficiently familiar with the diatoms to name the species; but it resembled *Navicula radiosus*. The little diatoms were very active, gliding hither and thither, and knocking the quartz-sand grains about. Noticing the latter, he made some comparative measurements, and found that the *Navicule* would move grains of sand as much as twenty-five times their own superficial area, and probably fifty times their own bulk and weight, or perhaps more.—*Proc. Acad. Nat. Sci. Philad.* p. 113.

On the Peripheral Nervous System of the Marine Nematoids.

By M. A. VILLOT.

The marine Nematoids possess well-characterized organs of sense, consisting:—1, of organs of touch, represented by numerous setæ or papillæ distributed over the whole surface of the body, but particularly abundant round the head and the genital orifice; 2, of an apparatus of vision, composed of two eyes, of rather complex structure, situated on the dorsal surface towards the anterior extremity. The nature of these different organs ought not to be doubtful; but the fact is that their relations with the nervous system have hitherto been very obscure. According to M. Marion * nervous filaments penetrate obliquely “into the midst of the longitudinal muscles to arrive soon at a fusiform, nucleolated cell, itself situated at the base of a cuticular hair, and united with this hair by another nervous thread which terminates at the base of the hair.”

M. Bütschli, whose memoir is very recent†, has figured an analogous arrangement; but he states that he has not detected the fusiform cell described by the French writer. He expresses himself as follows:—“Marion states with regard to his *Thoracostoma setigerum*, that a little before the entrance into the setule a fusiform cell is interposed in each of these filaments; with the exception of gangliiform dilatations, which, however, seem to me to have no regular occurrence, I have detected nothing which could be interpreted in favour of this observation.”

In presence of these contradictory assertions it became necessary to undertake fresh researches, and to subject those which had been made to the check of the experimental method. Hence my attention was directed most particularly to this point when, in the month of May last, I commenced my investigation of the Helmintha of our shores, in the laboratory of Professor de Lacaze-Duthiers. Now it appears from my numerous observations made at Roscoff upon living individuals, and repeated at Paris upon my preparations, that the two naturalists whom I have just cited have been deceived by false

* “Additions aux recherches sur les Nématoïdes libres du Golfe de Marseille,” *Ann. Sci. Nat. Zool.* 5^e série, tom. xix. p. 13, pl. xx. fig. 1.

† Zur Kenntniss der freilebenden Nematoden, insbesondere der des Kieler Hafens. p. 8, pl. iv. fig. 19, b (1874).

appearances, due probably to compression, and that they have not seen the true arrangement of the peripheral nervous system of these little creatures. As this arrangement is really very remarkable, I shall now give a short description of it.

Beneath the cuticle, which is smooth or striated, but always structureless, we find a very thin and very refractive granular layer. This layer has neither been figured nor described by M. Marion; but Dr. Charlton Bastian*, in 1866, indicated it very clearly, and even recognized that it contained cells. To investigate it properly it is necessary to macerate entire worms in a mixture of acetic acid, alcohol, glycerine, and water—a mixture which has already rendered me great service in many cases, and the formula of which I have given in my '*Monographie des Dragonneaux.*' The marine Nematoids, when immersed in this liquid, quickly became perfectly transparent. We can then see very distinctly that the granular layer situated between the skin and the muscles consists in great part of very fine fatty granules, and that it contains, scattered through it, small stellate cells furnished with a very refractive nucleus.

The relations of these little cellular bodies to the setæ or papillæ are easily ascertained. In a longitudinal section we perceive very distinctly that from the apex of each cell, perpendicularly to the axis of the animal, issues a very delicate thread which, after having traversed the whole thickness of the cuticle, arrives at the base of the papilla and enters it; but each cell also furnishes laterally a certain number of processes which place it in relation with the neighbouring cells; and it is equally easy to ascertain this, if, instead of making a section of the animal, we endeavour to follow the granular layer over a certain portion of its surface, by gradually raising the object-glass of the microscope. The subcutaneous layer of the marine Nematoids, therefore, contains a true network of ganglionic cells, which furnish nervous threads both to the organs of touch and to the organs of vision. This peripheral network is in relation with the central nervous system by means of a plexus, which traverses the muscular layer and unites the ventral nerve with the subcutaneous layer.

These are undoubtedly facts of detail and of delicate observation; but still they are of importance, for they are not isolated. It will suffice for me to recall that various observers have indicated a very analogous network in the Actiniæ, and that I have myself described one exactly similar in *Gordius*. This network arrangement of the ganglionic cells is certainly less rare in the Invertebrata than has hitherto been supposed; and it is probable that it represents in itself the whole of the nervous system of inferior types.—*Comptes Rendus*, February 8, 1875, p. 400.

* "On the Anatomy and Physiology of the Nematoids, parasitic and free," *Phil. Trans.* 1866, vol. clvi. part 2, pl. xxviii. fig. 36, *d.*